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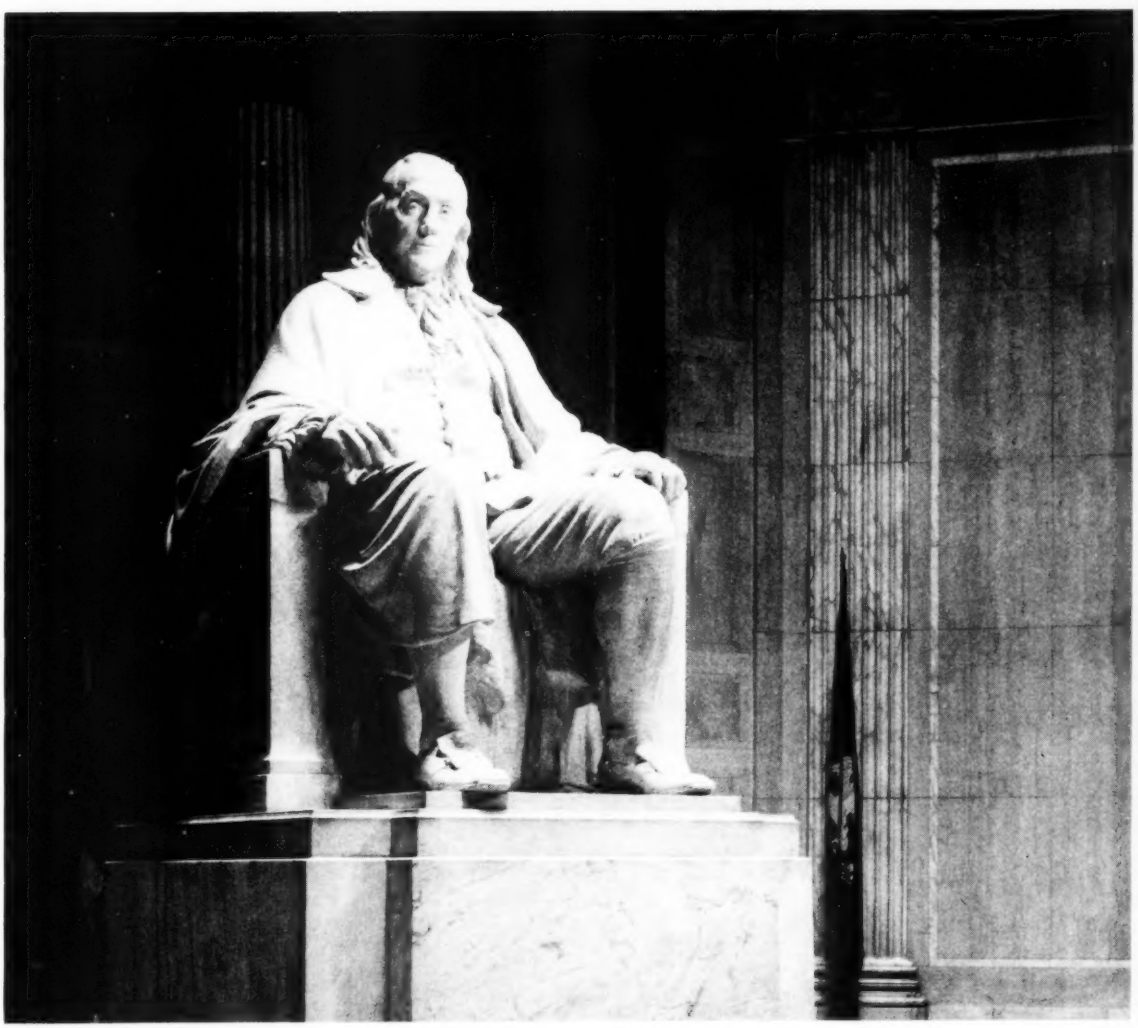
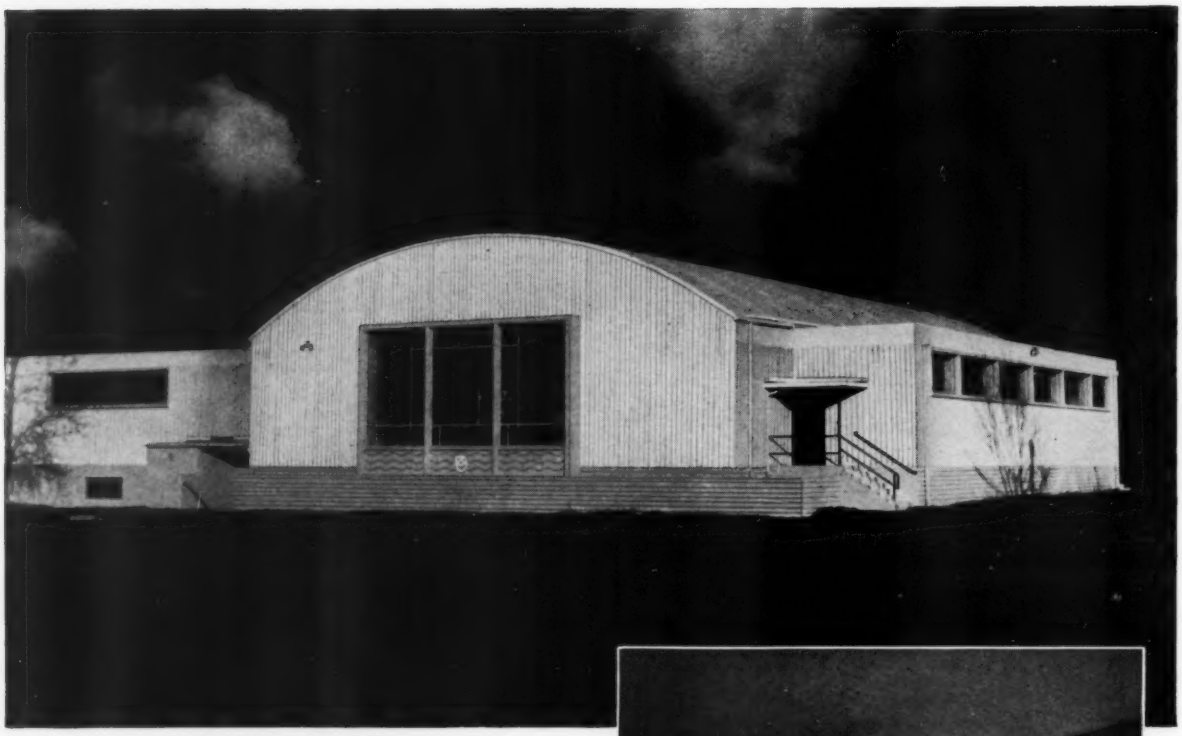


WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

ENGINEERS CAN CHANGE THIS TROUBLED WORLD—PAGE THREE

Vol. 8 JANUARY, 1956 No. 8



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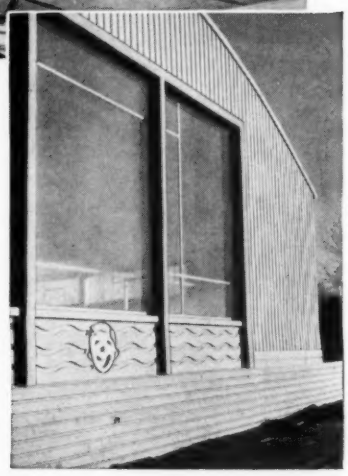

Top: Attractive exterior of the Green Lake swimming pool building of the Seattle, Wash. park department.

Center: In the interior of the building the concrete shell roof made possible a large unobstructed area.

Right: Interesting decorative touches were cast in the exterior architectural concrete wall surfaces.

Architects and engineers: Lamont & Fey. General contractor: Cawdry & Vemo. Both firms are from Seattle.

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COVER STORY

Benjamin Franklin, the first American engineer, was born on January 17, 1706. Franklin was also an inventor, philosopher, printer, public servant, publisher, and writer. Further, he was one of America's greatest statesmen. The Western Society of Engineers honors Benjamin Franklin on this, the 250th anniversary of his birth. A photograph of his statue appears on the cover of this issue of "Midwest Engineer." The 30-ton statue, of marble, is located in Franklin Memorial Hall, The Franklin Institute, Philadelphia.

The meeting of Jan. 24

Free Cocktail Hour
5:15 to 6:15 p.m.

Dinner
6:30 to 7:30 p.m.

Coffee Talk
7:30 to 7:45 p.m.

"The White Sox"
By Charles A. Comiskey, vice-president of the American League Baseball Club.

Session 1.
8:00 p.m.

"Progress Must be Created"
By Robert De Vore, midwest district manager, Extension Division, E. I. du Pont de Nemours & Company.

De Vore—a former Washington D.C. newspaper and magazine correspondent, with the Washington *Post* and *Collier's*—will give a talk, the theme of which will be that America can continue to progress only by producing more of the necessities and comforts, which are the real basis of wealth. Several examples of recent achievements along this line will document the talk.

Session 2.
8:00 p.m.

"The Loud Speaking Telephone"
By Edward S. Petersen, senior project engineer, Automatic Electric Co.

Petersen has been associated with the industrial application of telephone switching systems, and was instrumental in the development of the loud speaking telephone. He will discuss and demonstrate the Automatic Electric Company's type 88 equipment.

Session 3.
8:00 p.m.

"Booby Trap Castle"
By a panel of experts, including M. F. Griesel, publicist; Robert C. Peterson, professor, Fire Protection and Safety Engineering, Illinois Institute of Technology; and Lillian Stemp, author.

Your home is your castle, but look out for its booby traps. The panel will cover the subject in its many phases—such as frequency, severity, and cost of home accidents—and advise how to avoid them. Safety gadgets in the home will be discussed, as well as fatigue and its elimination.

Bring your wife—she'll enjoy this program.

Noon Luncheon Meetings
Don't forget them. They are held regularly on Wednesday, 12:15 noon to 1:15 p.m. See your postcard for speakers during January and February.

February 3, Caribbean Night
This is the first Ladies' Night of the 1956 season. It's an event you won't want to miss, so why not make arrangements to attend, today. Place, Western Society Headquarters. West Indian Bazaar, 5:30 p.m.; Montego Bay dinner, 7:00 p.m.; Caribbean Rhythms, a floor show during and after dinner; and "Island Hopping in the Caribbean," another new and colorful movie presentation by R. H. Bacon. Price, only $5 for each person. Make your reservations now.

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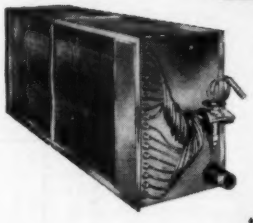

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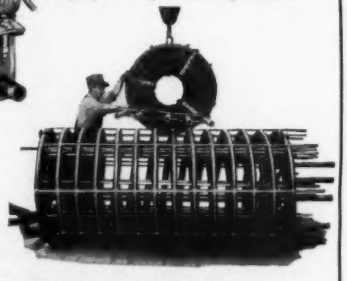

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An Engineer Says

"Engineers Can Change This Troubled World"

By L. C. Jordan

Engineers have been called upon to do many and varied tasks.

Today, they are faced with the most important challenge in their history.

World peace, to a surprising degree, is an engineering problem. According to Arthur Toynbee, the famous historian, one of the fundamental causes for world tensions is the rapid rise of Technology. Distances have been narrowed between civilizations and countries.

The "have-not" nations are familiar with the advantages enjoyed by the "have" nations. They are struggling to achieve similar benefits. They will follow the road that promises to lead most rapidly in that direction.

Engineering is helping to solve this problem now — but its help must be multiplied if tensions are to be reduced and wars eliminated.

Franklin's Practical Suggestions

How can we, in the Engineering Profession increase our activities in this direction?

There are several practical ways. Perhaps the most important are the communication of engineering ideas after the manner of Franklin, and help in relieving the critical shortage of young engineers, scientists and technicians.

In 1783, Benjamin Franklin wrote to Sir Joseph Banks, president of The Royal Society in London: "What vast additions to the conveniences and comforts of living might mankind have acquired, if the money spent in wars had been employed in works of public utility! What an extension of agriculture, even to the tops of our mountains; what rivers rendered navigable, or joined by canals; what bridges, aquaducts, new roads and other public works, edifices and improvements . . . might have been obtained by spending those millions in doing good . . . instead of doing mischief."

President Dwight D. Eisenhower, in his great plea for international reduction in armaments, emphasized that a part of this reduction should be employed in spreading the practical applications of science (which is the work of the engineer.)

Secretary of Agriculture Ezra Taft Benson recently said:

"Today, we recognize that the agricultural scientist is as important to building permanent peace as even the greatest Statesman."

An Inspiring Challenge

This is an inspiring challenge to the engineering profession today. No one expects the engineer to replace the statesman in international discussions on the reduction of armaments.

But the engineer's influence can be a powerful factor in creating understanding of what such a goal would mean. He can communicate, as Franklin did, the practical suggestions and know-how that will make millions of people realize how much such action will be to their personal advantage.

Benjamin Franklin once said: "Would you persuade, speak of interest — not of reason."

That is one of the kernels of the problem today. Nearly every one can reason on the wastefulness and futility of war and heavy burdens of armament. But very few people speak in terms of just what it means to the individual's own personal interest and advantage. The engineer, better than anyone else, can do that.

A Few Examples

In mankind's long search for higher living standards, his greatest ally has been multiplying his own usefulness by energy from water, coal and other fuels. B. V. Murphree says that the average American worker already has increased his effectiveness 260 fold by his present consumption of energy.

No other country even approaches that figure. It is partly responsible for the fact that the average American worker can earn more in a few days than many others can in weeks or even months. The U. S. Bureau of Labor estimates that the average American earns enough in three days to buy a suit of clothes—where the average Russian must work 47 days to accomplish the same result. The American works only half an hour for a pound of beef—when the Russian must work half a day for an even lower quality pound.

The engineer can place this invaluable source of power at the finger-tips of people anywhere—through their natural resources or, in the early future, the miracle of the atom. No propaganda is as important as the practical earning power of people—and that is the engineer's job.

When a man has to spend more than half of all he earns for food, he has little left for clothing, housing and higher living standards. The American, with 260 mechanical servants working for him, needs to spend only 20% on food and has 80% left for other necessities and for the enjoyment of highest living standards on earth.

We in the engineering profession must speak out frankly on this subject, just as President Charles Allen Thomas of Monsanto did when delivering the 26th Steinmetz Memorial Lecture. Mr. Allen said that the number of man hours worked in 1952 were about the same as in 1928—yet the value of our national

Mr. Jordan, an electrical engineer, is a member of the 250th Anniversary Committee, established to help celebrate the birth on Jan. 17, 1706 of Benjamin Franklin, the first great American engineer. Mr. Jordan prepared this message especially for engineers.

product rose from 104 billion dollars in 1929 to 350 billion dollars in 1953. The big difference was in the number of engineers. There was only one engineer to every 100 workers in 1928. There was one to every 40 workers in 1953—and the national product increased 300% for the same number of man-hours.

Even Life Itself

Engineering knowledge is needed, not only for material progress, but even to prolong life itself in many countries. Carl T. Rowan, of the *Minneapolis Tribune* wrote a startling article on *"Inside India."* He said, dramatically, that in the short time it took to eat lunch on the plane, 131 Indians died of tuberculosis; 400 died of malaria; 125 more died of cholera, smallpox or the plague. The average Indian lives to be only 27 years old.

The basic reason why the people of this country with a population of 365 million, have such a short span of life is the limited number of engineering projects. More could clear swamps, promote sanitation and provide adequate nutrition for badly nourished citizens.

But, it is sometimes argued—as in China—"If you lengthen the lifespan in countries over-crowded, will that not mean even more malnutrition and starvation.

Again, the engineer has the answer to that. In Benjamin Franklin's time it took four farm families to produce enough food and clothing for five non-farm families. Almost half the population had to work on farms. There were few available for industrial production, health and welfare services or general development.

Today, Secretary Benson says that the average American farmer produces enough for 17 others, on an even higher standard of living. This is the work of the agricultural scientist and the agricultural engineer. Between them, they have multiplied the produce of agriculture many-fold. They have eliminated the fear of starvation and released millions of people for industrial work—which is the great need in countries all over the earth.

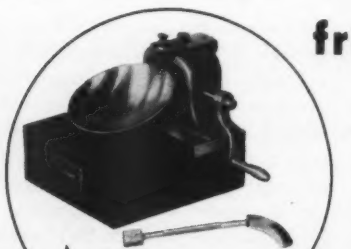
Yet The Shortage Grows

In the face of the great and growing need for more engineers, it is a serious fact that no country of the Free World is graduating enough of them.

Take our own situation here in America. In 1950, the nation's colleges graduated 50,000 engineers. In 1954 this had declined to only about 20,000. The number of graduates equipped to teach technical subjects had also fallen by 50%.

H. A. Meyerhoff, head of the Scientific Manpower Commission, said we have an immediate need for 35,000 to 40,000 more Engineers than are available. College placement bureaus report many more requests for young Engineers than can be filled. The *Wall Street Journal* says that as many as 5 to 10 jobs are offered to a single graduate, with starting salaries averaging from $370 to $440 per month. One placement bureau estimated 70,000 technicians needed with only 13,000 becoming available in June.

(Continued on Page 13)



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Demonstrated Lecture on

Static Electricity

By William Eathorne

The lecture on static electricity, with its accompanying demonstration, is one of several methods employed by the United States Bureau of Mines in its safety educational work. The interest of the general public in static electricity is increasing, as shown by the demand for the demonstrated lecture and for copies of the narrative used therewith. The latter is the reason for this attempt to prepare the writer's notes in manuscript form. This presents some difficulty not ordinarily encountered in preparing a lecture in written form, because the lecture is given in an informal manner and may be changed from time to time to suit the particular interests of the audience and the time available for presentation. Another difficulty is loss of effectiveness, because the demonstrations are of greatest interest and of course cannot be reproduced here.

The narrative consists largely of an explanation preceding the demonstrations. Since a lengthy description of the demonstrations would serve little purpose in a publication of this kind, the demonstrations are listed briefly at the end of the article. Apparatus used in the demonstration is shown in figure 1.

PRELIMINARY NARRATIVE

Purpose of the Demonstration

This demonstration of static electricity is one of several safety educational features presented by the Federal Bureau of Mines. Its specific purpose is to show how fires and explosions may be caused by static electricity if suitable conditions exist; in presenting it, an effort will be made to provide safety education in an entertaining manner. Before the demonstration begins it will perhaps be advisable to take about 10 minutes of your time to discuss a few highlights of static electricity so that you may be better prepared to appreciate and understand the demonstrations presented.

Difference Between Static and Current Electricity

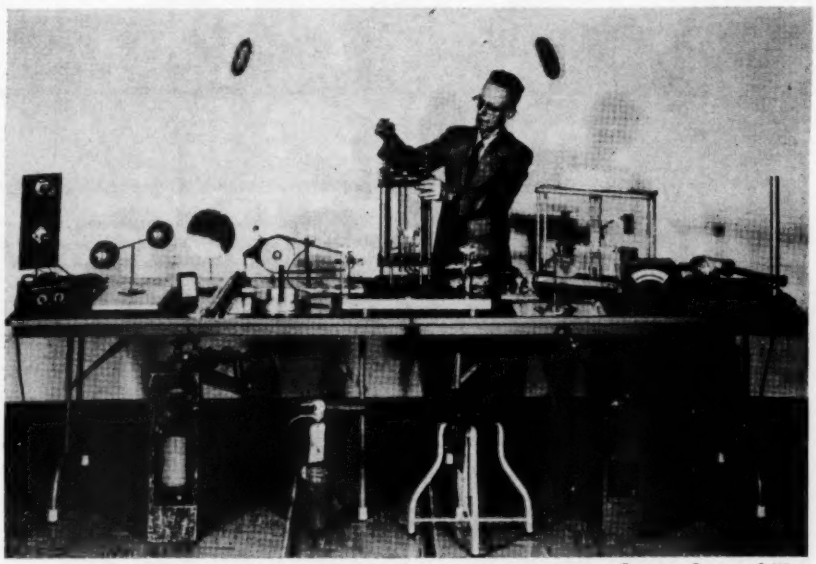
Considerable confusion seems to exist in the minds of many people—practical electricians included—on just what static electricity is and what makes it "tick." The reason for the confusion is probably the fact that the source and method of generation of static electricity and "current electricity" are entirely different. Current electricity is generated by means of dynamos in which magnetism plays an essential part, but static electricity is generated when two substances, somewhat different in character, have touched each other and then become separated. Magnetism is not involved in the slightest degree in the generation of static electricity.

Static electricity must not be confused with the term "stray current," because a stray current is leakage of electricity from the planned path (electrical wiring, etc.) provided for preventing current electricity from passing to the ground.

Current electricity is a development that came into use during the latter half of the 19th century, and the first successful commercial dynamo for generating it was not actually put to use until about 1880. Static electricity, however, has been generated ever since the origin of man, and long before that. Since lightning is an outstanding example of static electricity, no man will ever know when it was first generated. Perhaps a brief discussion of the history of static electricity will help to provide some idea of what it is and where it comes from.

History of Static Electricity

The first recording of a manifestation



— Courtesy, Bureau of Mines

Figure 1. General assembly of "Static Electricity" demonstration.

Mr. Eathorne, Bureau of Mines, United States Department of the Interior, presented this demonstrated talk before the Western Society of Engineers in Chicago, on Oct. 18, 1954.

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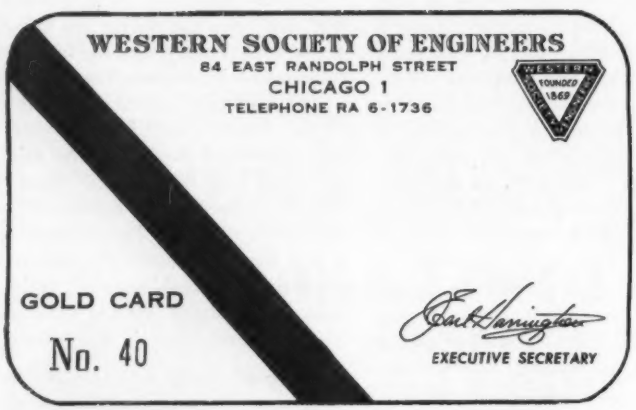

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of man-made static is credited to a Greek named Thales about 600 B.C. He rubbed a piece of amber with a piece of wool or silk and found that bits of straw, lint, etc. jumped to the amber. Thales offered no explanation as to why this happened.

About 2,200 years later (about 1600), Dr. Gilbert, Queen Elizabeth's physician, found that what Thales discovered was not limited to amber. Gilbert noticed that sulfur, wax, glass, and other substances had properties similar to amber in a greater or less degree. He, too, could not explain the phenomenon, but he coined the word "electric" to fit his discovery. From Gilbert's choice of a term or modern word "electricity" was derived.

Soon after Gilbert's discovery, studies and experiments began to develop in many countries, and in 1670 the first machine was built for generating static electricity. From that time, on through the 18th and most of the 19th centuries, numerous laboratory devices were designed for generating static. Virtually all our modern laboratory-type static generators are modifications of the 17th, 18th, and 19th century developments. All such devices seem to utilize friction in generating an electric charge; thus the term "frictional electricity" came into common use.

The third outstanding historical event in connection with static electricity occurred in 1752, when Franklin flew a kite during the approach of a thundercloud from a field on the outskirts of Philadelphia. He discovered, what he probably anticipated, that a thundercloud has an electrical charge and correctly concluded that its origin must be from a static source. Shortly thereafter Franklin invented the lightning rod.

Although today static electricity is credited as being a nuisance, its untold value to scientists during the 18th and 19th centuries, when the foundation of current electricity was being built, should not be overlooked.

What Is Static Electricity and Where Does It Come From

As studies progressed, scientists began to suspect that electricity exists in all nature, but they could not "pinpoint" just how it existed. It was not until 1911, when Rutherford (a British scientist) suggested a nuclear theory for the structure of an atom, that sound knowledge was brought to light on the origin of static electricity. Bohr's (a Danish scientist) concept of the structure of an atom, as suggested by Rutherford, is ideal for showing how static electricity is generated. The atoms used as illustrations in figure 2 are not necessarily static generators; they are merely furnished as an example. (A blackboard is used to describe the selected atoms.)

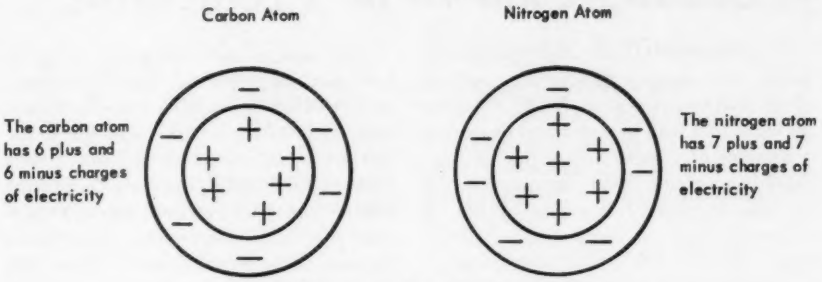
Carbon Atom
Nitrogen Atom
The carbon atom has 6 plus and 6 minus charges of electricity
The nitrogen atom has 7 plus and 7 minus charges of electricity

Figure 2. Plus and minus charges in atoms.

If a minus charge should move over from the nitrogen atom to the carbon atom, it will result in an unbalanced condition in both atoms. The carbon atom with more minus than plus charge has become minus-charged, while the nitrogen atom with too few minus charges has become plus-charged. Static electrical charges, irrespective of whether they are plus or minus, are therefore produced solely by a gain or loss of minus charges. The technical name for plus charge is a "proton" and for a minus charge it is an "electron."

The number of minus charges in a very small amount of matter is almost unbelievable; however, all of them are not available for generating static electricity. The few minus charges available for transfer constitute an infinitesimally small number when compared to the total in storage. This fact is very fortunate for all of us.

A drop of water contains about 2 million, billion, billion minus charges; expressed in figures it is 2 followed by 24 zeros.

How Static Electric Charges Are Formed

In everyday life, static electrical charges usually come from nonconducting substances and are readily transferred to conducting substances. If the conductive substance is insulated, the charge may be retained for a considerable time. The writer has stored dangerous static charges generated from

(Continued on Page 15)

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Seiches Said to be Predictable

The disastrous Lake Michigan storm surge that came without warning one clear morning in June 1954, bringing an eight-foot wall of water and drowning a number of persons along the Chicago lakefront, could have been predicted in time to prevent this loss of life. A different kind of surge—the Atlantic flood of Nov. 6-7, 1953, which caused tremendous damage to the Long Island, Staten Island, and New Jersey coasts—likewise could have been anticipated as could many other freak waves, which from time to time have taken a terrific toll of life and property.

This is the contention of three geologists at Columbia University's Lamont Geological Observatory at Palisades, N. Y., who will conduct a three-year project to test their theory that several hours warning of storm surges can be given. The important project, which is under the sponsorship of the American Institute of Mining and Metallurgical Engineers, is being instituted with an Engineering Foundation grant. In charge of the investigation are Dr. Maurice Ewing, Director of the Observatory, Dr. Frank Press, and Dr. William L. Donn.

These scientists believe that when a line squall with its accompanying area of high pressure travels over water at a velocity equal to the normal velocity of a wave of water of the particular existing depth, a resonant effect is produced which can augment the normal wave to disastrous magnitude.

Fortunately the critical combination of atmospheric disturbance and natural wave period rarely occurs, but the Lake Michigan surge appears to have been one of these rare instances. While weather in the Chicago area was clear at the time the wave struck, two hours before it struck the area was visited by a severe squall with winds up to 66 miles an hour. The squall was accompanied by a pressure-jump, or band of increased air pressure. After passing over the city, the squall and pressure-jump traveled 40 miles across Lake Michigan, arriving at Michigan City, Ind. (on the eastern shore directly across from Chicago) simultaneously with a wave from the northwest. Eighty minutes later the reflected eight-foot wave washed back on the Chicago lakefront.

The idea is not completely new. It has been suggested by British scientists as a possible explanation for abnormally high Thames River tides and for a disastrous surge occurring off the Sussex coast in July, 1929. However, the project getting under way at the Lamont Observatory with Engineering Foundation support is the first attempt to formulate a scientific explanation of the Lake Michigan freak wave and to prove the theory of air-to-water coupling.

Since only for equal velocities can a large wave be generated, the project will have to show that appropriate velocities existed at the time of the surge. From U. S. Weather Bureau records of past storms and surges, it is studying surges to see whether appropriate storms existed, and appropriate storms to see whether they generated surges. With these studies as a basis, trial forecasts of lake surges will be made.

The program of course involves continuous monitoring of the kind of atmospheric disturbances Drs. Ewing, Press, and Donn think is responsible for the Lake Michigan-type surge. This check on storms will be handled by a new type of instrument sensitive enough to record disturbances that might generate small surges as well as those of more disastrous size. This will mean more case histories to work with. The instrument—made especially for the project and called the Wallace Microbarograph—is being installed at a lake station.

Water-level records must be carefully studied, too, of course. And to be sure of the complete accuracy of the recorder used, the geologists are building their own in the heavy-metal shop the Observatory boasts—a shop equipped for making everything from the most delicate watch spring to a heavy pile driver. The water-level recorder will also be installed at a lake station and operated by the U. S. Lake Survey, which will mail daily records to the Observatory.

When the studies of Great Lakes atmospheric disturbances and water levels are well established, the storm surges investigations will be extended to the coastal oceanic type of flood, with the Atlantic flood of November 1953 the special case study. After these two studies are completed, the Lamont Observatory geologists expect to investigate surges of both types in the Gulf of Mexico, the Caribbean, and Lake Maracaibo.

If the project confirms their theory, it will probably mean that several hours' advance warning of freak waves can be given on the basis of the position and velocity of a line squall. It may also mean that such waves can be forecast for an area from a study of the occurrence of similar disasters in the past.

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The importance of a successful outcome to the program in preventing loss of life—the fishermen warned not to go out, the bathers and coastal dwellers alerted to their danger—cannot be exaggerated. A few hours' warning of disaster would often prevent property loss, too, and would be especially valuable in operations like offshore oil drilling.

Car Appearance May Not Change Much

The car of tomorrow will look much like vehicles on the road today.

At least that is the conclusion you might draw from the prize-winning model car designed by a young Chicagoan for a national competition.

John A. Stein, 20, mechanical engineering student at Illinois Institute of Technology designed and built the model, which has received both national and state honors in the Fisher Body Craftman's guild model car competition.

He received $150 as first place award winner in the senior age division for Illinois. As third place national winner, he received a $2,000 scholarship at Illinois Tech.

Stein's car is a 16-inch scale model hard-top convertible. It is carved of wood and was judged for exterior body design only.

Strongly suggestive of current models is the hood and trunk treatment. Both the hood and trunk jut outward horizontally from the mass of the car. They are wide and flat and do not taper off at any point.

The Illinois Tech student's design is simple and uncluttered. Contributing to the familiar look of the car is a wraparound windshield. Decoration is minimal with the two-color paint job constituting the major part. A light color predominates with a darker tone accenting rear fenders.

Metal trim is clean and sleek. Stein used polished aluminum to fashion bumper, grill, handles, and other trim on his model. On a full scale car, the trim would be chromium-plated steel.

Judges examined the entries for quality of workmanship and design. The model car had to be practical from both production and safety aspects. For instance, it could not have winglike projections, forward suspended headlights, or any other "streamlined" devices that might be hazardous on the highway.

Faithful adherence to scale was another requirement of the young designers' models. In the 16-inch models, one inch represented one foot.

Originality and artistic merit were the chief considerations in judging the design. Stein said contestants indicated the category, such as sedan, sports car, or convertible, for which their cars were designed.

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Nominating Committee Is Newly Appointed

To the Corporate Members:

I am pleased to announce that in accordance with Article X, Section 3, of the Constitution, the Board of Direction has appointed a Nominating Committee as follows:

John F. Sullivan, Jr. (Board Member)
Ovid W. Eshbach
Richard D. Harza
H. P. Sedwick
George W. Serat
Ludwig Skog
Virden E. Staff

The Constitution also provides that suggestions for nominees shall be solicited in the publications of the Society.

J. EARL HARRINGTON
Executive Secretary

Tear off and Return

To the Nominating Committee,
Western Society of Engineers:

I suggest the following names for consideration by your committee for offices indicated.

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U. S. Firms Get European Data

American companies now can keep abreast of European technological developments at less than the cost of one good researcher.

The unique service is being offered by Armour Research Foundation of Illinois Institute of Technology, Chicago, to a group of 16 noncompeting firms.

Under the program, the Foundation will set up a European office to funnel ideas and techniques of potential value in the American market to the participating companies.

Announcement of the program—known as the European Technical Observation Group plan—was made by Dr. Haldon A. Leedy, director of the Foundation.

"The program is designed to meet the increasing need for up-to-date information about research and development in Europe," he said.

The plan is expected to have special appeal to small and medium-sized companies interested in keeping informed at relatively little cost, according to Leedy.

Leedy asserted that procedures for European liaison at present are costly and haphazard.

"Large corporations often learn of new developments through their overseas sales offices, but most small and medium-sized firms must depend on foreign periodicals, occasional correspondence, and visits from Europeans to promote specific ideas.

"The information time lag for many of these companies is considerable—and expensive," Leedy stated.

In addition to producing usable ideas, he explained, the European Technical Observation Group plan will provide the following advantages:

—Literature review and translation services necessary to keep informed of scientific progress in Europe.

—The "insurance value" of making certain that a competitor will not obtain prior knowledge of European developments.

—Special technical commissions will be carried out at no extra cost.

—Valuable contacts will be established in anticipation of increased foreign trade when the Great Lakes are opened to ocean going vessels.

Armour Research Foundation's plan will be directed by Irving D. Canton, ARF international department project coordinator, who conceived the program.

Initially, the Foundation will establish a European office staffed by four engineers under joint sponsorship of 16 noncompeting companies.

Each engineer will be assigned prime responsibility for the four sponsoring companies most closely representing his field of engineering, Canton said.

An electrical engineer, thus, might represent companies which produce electric motors, communications equipment, electrical instruments, and electrical components.

"In his travels," Canton stated, "an electrical engineer would run across items of interest to the other sponsors and funnel them back through the other three engineers."

"Under this plan, a sponsoring company would obtain almost personal attention in its field and effective coverage in related fields," he added.

Sponsors for the program will be sought in groups of four, possibly from the mechanical, electrical, chemical producing, and chemical engineering industries.

Participating companies will be asked to sign up for a two-year contract initially, with renewal being on a yearly basis.

Later, other groups of four noncompetitive companies with similar interests might be added, according to Canton.

"An additional observer would be added for each new group of sponsors to avoid dilution of services," he said.

The observers, he elaborated, would be chosen carefully on the basis of ethical, technical, and linguistic considerations.

The observers, as the plan is outlined, would attend pertinent seminars, technical society meetings, conferences, and trade shows.

They would arrange for invitations to visit plants and laboratories and also would review technical publications, patents, and other developments.

A mail survey, Canton said, has indicated that American and European companies and governments are enthusiastic about the European Technical Observation Group plan.

Included among the letters of encouragement are notes from the U. S. departments of State and Commerce.

Oh, This TV!

Army future equipment will include a reconnaissance drone missile that will transmit a television view of enemy terrain to a hovering helicopter for relay to ground forces, *Aviation Week* reports. Currently, excessive helicopter vibration is the obstacle to airborne television reconnaissance.

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Texas Loses Water By Evaporation

Texas is losing almost as much water from reservoir evaporation annually as it uses each year and a water evaporation conference held at Southwest Research Institute Dec. 1 to discuss the problem resulted in organization of the Southwest Cooperative Project on Control of Evaporation of Water from Reservoirs.

Col. E. V. Spence of Big Spring, general manager of the Colorado River Municipal Water District, was appointed committee chairman to seek sponsorship for a research project to check reservoir evaporation. Representatives of leading river authorities and water districts of Texas and other water conservation leaders attended the organizational conference.

Water conservation expert Dr. Louis Koenig, vice-president of Southwest Research Institute, told the group that Texas is losing about 7-million acre feet of water by reservoir evaporation each year. Total water usage in Texas is 8-million acre feet a year, he said.

Dr. Koenig proposed that further research be made on a thin (one ten-millionth of an inch) chemical coating for reservoirs which would check evaporation. The thin film coating is non-injurious to aquatic life and has no effect on use of water for municipal, industrial or agricultural purposes.

Dr. Koenig said research experiments using this method have been tried out in Australia for the past several years with encouraging results. Southwest Research Institute engineers have estimated that water could be saved by this method at a cost of less than 80 cents per acre-foot—the cheapest water in reservoirs in Texas.

Steel Arch Span Closed in Unique Way

The closing of Japan's longest steel arch span has recently been effected in a unique way, through the use of eight 300-ton capacity hydraulic jacks, *Engineering News-Record* says in an exclusive report on this engineering feat.

The jacks enabled the erection of trusses to be transformed smoothly and easily into the stress condition of the fixed arch. They also improved conditions of stress distribution through the arch by permitting the application of pressures to eliminate the tension on the upper chords.

The removal of erection stresses by this method was first tried on the Rainbow Bridge at Niagara Falls, the magazine points out, but the correction of stress distribution in this manner is thought to be an original attempt.

The span, a highway bridge over Inoura Narrows at the mouth of Omura Bay in the northwest of Kymushu Island, is intended to speed traffic traveling between Nagasaki and Sasebo. The center span is 800 feet long and is supported by the braced fixed arch. Total length of the bridge is 1,048 feet. Rise is approximately 113 feet.

Engineers to Learn On Dummy Reactor

Engineers soon may be learning how to operate nuclear energy reactors, not on actual units but on simulators that faithfully imitate behavior of the real thing, asserts *Power Magazine*. One such product now is being marketed commercially for training and research.

With the swing toward large-scale use of nuclear power, a whole new generation of operating men, schooled in fission process and control, will be needed. Since costly reactors are not readily available for instructional purposes, one answer to the training problem is the less expensive simulators, which respond like actual units in producing, maintaining and controlling nuclear chain reactions, the magazine says.

One device, believed by its manufacturers to be the first commercial nuclear reactor simulator, features an electronic "brain." When the trainee manipulates the controls, the "brain" instantly figures out how a particular real reactor would respond and sends signals to the instruments and control gear. At the same time the trainee can see the action of working control rods in a dummy fuel core. The electronic brain can be adjusted to imitate a variety of actual reactor types and can even be set to simulate emergency conditions or accidents.

Fast Traveling — 25 MPH for Bus

The nation's first intercity bus in the United States began operations in 1905 on a 95-mile stretch of road between the central Oregon towns of Bend and Shaniko, reports *Bus Transportation*. It was equipped with air brakes and an air whistle, yet not another motor vehicle boasted air brakes until 1921. The bus had a top speed of 40 miles an hour, but with a full load of eleven passengers, hit about 25 miles an hour on level ground.

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This Troubled World

(Continued from Page 4)

The Franklin Anniversary Year 1956, is a time to do something about that. Benjamin Franklin was the first American to bring practical, technical subjects into our schools and colleges. His life and achievements should be made an inspiration to thousands of youngsters to prepare for the brilliant opportunities in science, engineering and technology.

Here again, personal interest is the keynote. There are more jobs offered per graduate and higher starting pay in engineering than in any other general field. Youngsters are not going to study engineering just because Russia and China both have passed us in the number of scientific students, serious as that fact is. They will take such courses only because the great personal opportunities are there. That is what we must emphasize.

What Can I Do About It?

These are just a few of the many ways in which engineers can help change this troubled world. Even when all agree, the question arises, "Yes, but what can I do about it?"

Our first great American engineer told us the answer. Benjamin Franklin repeated over and over again that the only sure way to reach an objective in a democracy was to mobilize public opinion. He practiced that all of his life.

What Franklin did in an era of poor communications, is even more practical for us with the modern miracles of press and broadcasting.

Our problem is not the opportunity. It is the fact that all too often, we engineers think of ourselves as "Silent Men." We trouble ourselves too little about building public opinion. Even when we write for publication, we do so in technical terms that may be unclear to the average person.

But engineers must develop a more understanding voice if our great contributions to the world are to be realized. It is not enough just to *know how*. It is necessary to make the world want that knowledge—make them so eager to get it that the rising force of public opinion will make itself felt in the councils of all nations.

Every engineer who writes interestingly of the technical advantages of better understanding between nations—or who talks effectively to youth of the advantages in a technical education, is hastening the day when world tensions will be eased and peace brought nearer to reality.

That may be a startling statement to those of us who think of engineering only in terms of our immediate jobs. But it has become much more than that. It has become almost the only profession that can solve the difficult problems that divide people today, that can write the answer between peace and war.

If Toynbee is right in saying that the rise of technology is partly responsible for world tensions, then the greater spread and humanizing of technology should prove to be one of the cures.

Old Tooth Still Useful

In the heated-fluoridation battle in British Columbia, supporters of artificial fluoridation of municipal water supplies are toting around a 40,000-year-old, ten-pound elephant's tooth as "exhibit A" in favor of their case, notes *Chemical Week*. The massive molar belonged to an early-edition elephant, which found its way to the Puget Sound area by crossing the Isthmus from Siberia. Its perfect condition, so the reasoning goes, is largely due to the mammoth's diet—chiefly seaweed, plants and bark—which supplied prehistoric animals with large amounts of natural fluorides.

Something New in Oil

Today's petroleum processors are not standing still waiting to see what others are doing in the field of atomic radiation research, points out *Petroleum Processing*. At least seven oil companies—now known to have radiant energy facilities in various stages of development—are all studying the technique as a possible tool to use in processing petroleum hydrocarbons. Latest is the use of an electron gun to break apart and reform hydrocarbon molecules.

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C-E, Inc., to Build Nuclear Center

Combustion Engineering, Inc. has contracted for the purchase of a 530-acre site in Windsor, Connecticut, on which it will build a Nuclear Engineering and Development Center, it was announced Dec. 7 by Broderick Haskell, vice-chairman of the company.

The Center will comprise facilities for the complete design and development of nuclear power reactors, for the construction of reactor cores, and for the manufacture of related atomic fuel elements. Costing upwards of 5 million dollars, the center will begin operations late this year and by 1957 will employ several hundred people in its various departments, largely engineers, scientists and technicians. Stone & Webster Engineering Corporation have been engaged to serve as architects and engineers.

A large engineering and administrative building, a critical experiment facility for studying the physics and nuclear characteristics of reactor cores, a "hot" laboratory and a fuel element fabrication plant, together with related metallurgical, chemical and physical testing laboratories, are to be erected. Personnel of the company's Nuclear Power Division and Reactor Development Division will be transferred from New York to Windsor as soon as the buildings are ready for occupancy.

All manufacturing facilities at Windsor will be of the highly specialized type required for the production of "light" components such as reactor internals, control mechanisms and the like. These facilities will be designed to conform to all A. E. C. safety requirements.

All "heavy" reactor work will continue to be done in the company's main manufacturing plant in Chattanooga where reactor components thus far produced by the company have been fabricated.

Existing facilities at Chattanooga will soon be augmented by the completion of a new bay for the manufacture of heavy reactor components. Equipment will include a 15,000,000-volt betatron for fast X-raying of thick plate and welds, large precision machine tools and cranes to handle loads in excess of 300 tons. This multi-million dollar project will also include a dock equipped to handle reactor vessels too large and heavy for rail or highway shipment. With the completion of this project early this year, Combustion will become the first company in the world to possess facilities especially designed for the manufacture of heavy reactor components and to be able to make water shipment of such components through virtually all inland waterways and to all coastal points.

Haskell stated that Combustion Engineering, Inc. has been engaged in nuclear work since 1946 and today is one of the country's major suppliers of nuclear power equipment. In commenting on the contract recently awarded by A. E. C. for a submarine reactor system, he pointed out that the company thus became the third major contractor to enter the naval reactor development program and would be the first in the country to design and construct a complete naval nuclear reactor system with its own facilities.

Referring to other current activities of Combustion in the nuclear field, Haskell mentioned the following projects. The design and manufacture of nuclear components for the U.S.S. *Seawolf;* the Shipping-port plant of the Duquesne Light Company; the fast breeder reactor plant of the Atomic Power Development Associates (Detroit Edison Group); a large surface ship for the U. S. Navy and a new Submarine Advanced Reactor System. He also pointed out that Combustion, under an agreement with A. E. C. is currently engaged in design and evaluation studies of both large and small reactors and of fuel elements and their fabrication.

For a Soft Ride

Rubber paving, designed to eliminate the rattle and jolt from railroad crossings, is getting its first commercial tryout at West Salem, O., says *Chemical Week.* Railroad officials claim rubber crossing reduces maintenance costs and provides a smooth, cushioned surface for motorists.

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Static Electricity

(Continued from Page 7)

common objects for over a week.

Two nonconducting substances can generate static electricity provided there is an appreciable difference in their dielectric constants. Furthermore, two nonconducting bodies of the same substance having a noticeable physical difference, such as degree of polish or roughness, can generate static. The more polished body of the two will have the plus charge. Conductive substances can also generate static, but the charges will easily drain off as rapidly as they are generated if reasonably effective insulation does not intervene; in such instances, the accumulation of dangerous potentials is unlikely.

Water being a conductor, a slight trace of moisture on the nonconducting substance may render its surface conductive. Thus, we find that the relative humidity of the atmosphere when above normal may restrict, in some instances prevent, dangerous accumulations of static charges. Cool, dry weather is ideal for generating static, and hot, humid weather is detrimental.

Solids, liquids, or gases may be involved in generating static charges. It may be two solids, a solid and a liquid, a solid and a gas, or a liquid and a gas.

The Dangers of Static Electricity

A static charge potential of 50,000 volts or more can be fairly easily generated by some of the conditions we encounter in daily life. And in view of the fact that a static charge potential of 1,500 volts can initiate an explosion under certain conditions (to be discussed as the demonstrations proceed), we should be on the alert for the following known static generators whenever highly flammable liquids, gases, or explosive dusts are present:

Belt drives (rolling paper in a papermill acts like a belt drive).

Dust moving in piping.

Dust, smoke particles, dry snow, and water mists moving in air.

Contact of solids and rapid removal.

Blowing steam, compressed air, and gases.

Bubbling air or gases through liquids, notably air through kerosene in petroleum refining.

Induced charges—the charge acquired by a neutral body from a nearby charged body. Aircraft should avoid thunderclouds.

How Static Electric Charges May Be Avoided

Should static electricity be a hazardous problem, the following precautions will help in eliminating dangerous conditions. In certain extremely hazardous conditions, further precautions should be adopted to fit the circumstances. Time will not permit a thorough discussion of all the precautions that should be taken in all the conditions that we might encounter.

Elimination of nonconductors as much as possible.

Belt drives should be provided with grounded combs or special belt dressings.

Dust moving in blower or vacuum systems should have all metal parts bonded (pipe lengths, storage bins, vehicles, etc.) and an effective common ground.

Bonding of containers or tanks when transferring flammable liquids and also establishing an effective common ground.

Movable equipment, such as aircraft, gasoline trucks, etc., should be grounded when they come to a stop to drain off accumulated charges.

Preventing liquid drip when transferring flammable liquids.

Preventing the escape of compressed air, gases, vapors, and steam.

Humidification of the atmosphere to provide a conductive film of moisture on the surfaces of static generating mediums. A relative humidity of 70 percent has been recommended in recent years, but that may not prevent a charge potential from developing that could set off an explosion. I have exploded gasoline when the equipment used to generate static (a piece of aluminum and a piece of glass) had been exposed to a relative humidity of 80 percent for over 24 hours. The only assistance given to remove moisture from the surfaces of the aluminum and glass was wiping them with a piece of cloth that had not been especially dried.

Static detecting devices merit consideration where unusual sensitive conditions exist.

Air is an essential in an explosion or

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fire; it supplies the necessary oxygen to support combustion. Normal air contains about 21 percent oxygen. However, should oxygen-enriched air be present, an explosion or fire will be much easier to develop, and the violence will increase tremendously. Every precaution should therefore be taken to see that oxygen piping and cylinders are not allowed to leak where there is little air movement.

Time will not permit discussion of all the explosive sources that could be encountered. The average person should be careful when using gasoline, propane, butane, methane (coal-mine gas), natural gas, and acetylene. (See table 1.) Hydrogen, ether, and cyclopropane are still "hotter" than those just mentioned.

The number of fires and explosions caused by static electricity is not known. They are extremely difficult to detect, and investigators may not have enough knowledge of static to follow up when evaluating their findings.

The National Fire Protection Association reports that 47,160 fires are started in the United States every year (1947-51 records) from an unknown cause. Unquestionably many of them were caused by static electricity—just how many is anybody's guess.

DEMONSTRATIONS

The demonstrations that follow the narrative will cover some of the foregoing highlights on static electricity. Although static generating machines of the laboratory type are excellent devices for studying static, it is preferable where possible to demonstrate static hazards that might be encountered in everyday life. A special effort therefore has been made to use common objects in the demonstrations. The demonstrations are listed and outlined briefly as follows:

1. Duplication of Thales' discovery of static electricity.
2. The electrified toy balloons.
3. The electrified ladies' stockings.
4. Items with a similar charge repel each other, and items with opposite charges attract each other.
5. A gasoline explosion by rubbing a piece of plastic with the hand or a cloth.
6. A gasoline explosion by means of dripping water.
7. A gasoline explosion by means of dust blown through a piece of pipe.
8. Lighting a cigarette from the static generated by a belt drive.

TABLE 1.—*Flash point, vapor density, ignition temperature, and explosive range of various liquids and gases*

	Flash point, (degrees F.)	Vapor density (air = 1.0)	Ignition temperature (degrees F.)	Explosive range (percent concentration by volume)
Liquids:				
Acetone	0	2.0	1,000	2.6 - 12.8
Alcohol (ethyl)	55	1.6	793	4.3 - 19.0
Ether (ethyl)	–50 or less	2.6	356	1.9 - 48.0
Ethyl mercaptan	80 or less	2.1	570	2.8 - 18.0
Gasoline (60 oct.)	–50	3.7	536	1.4 - 7.6
Gasoline (100 oct.)			800	
Kerosene	100 to 165	4.5	490	0.7 - 5.0
Naphtha (Stoddard Sol.)	100 to 110	3.0 to 4.0	500	1.1 - 6.0
Petroleum ether	–50	2.5	475	1.4 - 5.9
Turpentine	95	4.8	464	.8 - ?
Gases:				
Acetylene		0.9	635	2.5 - 81.0
Ammonia		0.6	1,204	15.0 - 28.0
Butane		2.0	806	1.9 - 8.5
Blast-furnace gas				35.0 - 74.0
Carbon monoxide		1.0	1,204	12.5 - 74.0
Coal gas			1,200	5.3 - 32.0
Coke-oven gas				4.4 - 34.0
Cyclopropane		1.4	928	2.4 - 10.4
Formaldehyde		1.1	806	7.0 - 73.0
Hydrogen		0.1	1,085	4.0 - 75.0
Hydrogen sulfide		1.2	500	4.3 - 45.0
Methane		0.6	999	5.3 - 14.0
Producer gas				14.1 - 74.0
Propane		1.6	871	2.2 - 9.5
Sewer gas			1,170	7.5 - 19.0

Reference: Federal Bureau of Mines and National Fire Protection Association.

9. A piece of dry asphalt may not bleed off a static charge.

10. A piece of dry concrete may not bleed off a static charge.

11. A natural gas explosion from the static generated by a belt drive.

12. Lighting a fluorescent lamp by the static generated by a belt drive.

13. A propane explosion by contacting a piece of metal with a piece of ordinary glass.

14. A gasoline explosion from the static generated between two pieces of rubber.

15. A gasoline explosion in an oxygen-enriched atmosphere. This is done in a metal pipe for safety, using a lighted cigarette to initiate the explosion. Its purpose is to show the violence of an explosion when above normal oxygen is present.

Early Products and Today's Compared

Early commercial products with their 1956 counterparts are being featured in the Second Chicago Area Industrial Design exhibit Jan. 16-27 at Illinois Institute of Technology, Chicago.

Industrial design—yesterday and today—is the theme of the exhibit, according to chairman Stowe Myers.

Sponsored by the Chicago chapters of Industrial Design Institute and American Society of Industrial Design, the exhibition is focusing attention on mass-produced products designed by members of the two organizations.

Items ranging from household appliances and furniture to hardware and farm equipment are being displayed in Illinois Tech's new Architecture-Planning-Design building.

Included in the display are exhibits depicting historical, productional, professional, and educational aspects of industrial design, Myers explained.

In addition to focusing attention on Chicago developments in the field of design, he added, the designers hope to stimulate the public to appreciate and expect good design.

A two-day symposium on industrial design is being staged Jan. 19-20 in conjunction with the exhibit. Purpose of the symposium is to provide industry with information on the proper use of design.

The exhibit is open to the public from 9 a.m. to 9 p.m. weekdays and from 9 a.m. to noon on Saturday.

Lock-Pickers May Face Slim Pickings

Lock-pickers may find slim pickings in padlocks of the future as a result of a study under way at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Foundation engineers have developed a device that enables them to make design modifications which reduce the possibility of breaking into combination-type padlocks, it has been announced by Vincent J. Cushing, manager of the ARF propulsion and structural research department.

Developed in the materials engineering section of the department, the instrument is used to study the amount and location of wear in locks. The study is being conducted for the Dudley Lock corporation, Crystal Lake, Ill.

The new device is designed to produce an accelerated use pattern that simulates a 20-year wear level in padlocks within a period of 24 hours, according to David Horwitz, project engineer.

Eight locks can be studied simultaneously, Horwitz explained.

The locks are held rigidly while a wheel attachment on the face of the lock rotates the tumblers. This action produces wear in the operating mechanism and reveals where fatigue occurs.

To date, the study has revealed that excessive forces acting upon the spring tension create wear in the lock. Design modifications have been recommended by Foundation engineers that will reduce spring tension and distribute wear more uniformly throughout the lock.

Engineers also have recommended design changes which will modify the pall —or locking device—to reduce the play in the operating mechanism. The modification also will tend to increase the over-all strength of the lock.

Armour Research Foundation scientists currently are engaged in a study of the strength of materials used in the manufacture of combination padlocks.

According to Horwitz, certain components of the lock may be strengthened by changing the type of material used for particular components. This in turn helps increase the strength of the lock.

There also is a possibility that some of the new techniques developed in heat treatment of materials can be utilized in strengthening materials for padlocks, he pointed out.

Work Starts on Inland Steel Building

The general contract for constructing the Inland Steel Building, to be erected at Dearborn and Monroe Streets in Chicago, has been awarded to Turner Construction Company it has been announced. Work will start immediately and completion is scheduled for mid-1957.

The building is to be a 19-story stainless steel and glass structure, the first major addition to Chicago's Loop office buildings since the Field Building was erected in 1933. It was recently announced that its ground level and second floor will become the headquarters of the Chicago Association of Commerce and Industry; Inland will occupy the top seven floors.

The architects are Skidmore, Owings and Merrill.

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San Francisco ESPS Is Now 30

The Engineering Societies Personnel Service San Francisco office opened in January of 1925. ESPS as a cooperative enterprise was established by four national engineering societies in New York to help engineers find new or better jobs and employers to locate qualified personnel needed in technical work. Later, extended to San Francisco it has operated from the start in the same offices, Suite 715, Mechanics Institute, 57 Post St., with the same manager, Newton D. Cook, 219 Linda ave., Piedmont, Calif.

In 30 years, thousands of engineers of every kind and at every level have sought employment assistance; thousands of western engineering jobs in every technical occupation have been made available; San Francisco-ESPS has filled 8,000 western engineering positions, probably 50 million dollars in terms of today's average annual salary. San Francisco-ESPS has long been established in the western engineering community. Engineers placed work in every part of the world and the United States and in every branch of engineering; 2500 civil engineers in construction, government, consulting; 2000 mechanical engineers in industry, design, manufacture; 2000 electrical engineers in laboratories, production, sales; 1500 mining engineers in production, extraction, fabrication, reduction.

ESPS was established in 1918 as a non-profit service operating in the east after World War I to help engineer veterans find jobs in civilian life. Originally sponsored by the American Society of Civil Engineers, American Institute of Mining & Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers it now includes ten national or regional cooperating societies and organizations with a membership approximating 200,000; and provides a nationwide employment service available to 550,000 U.S. engineers at professional, technical and subprofessional levels through offices in New York, Chicago, Detroit and San Francisco.

In war time and in peace, in prosperity and depression ESPS-San Francisco has maintained a clearing house for engineer and technical employment. The four founder societies, represented by their National Secretaries, establish the policies of ESPS and their executive director, Alfred H. Meyer of New York, directs operations to provide aid for the entire engineering community, member or non-members, employers or employees. ESPS-Western Representative Joseph R. Decker of San Francisco is associated with the development of ESPS in the West.

From the start, San Francisco-ESPS has been guided by committee representation from local sections of cooperating societies. San Francisco engineers of substantial stature serve and contribute generously of time, effort and counsel to assure a suitable employment service for western engineers. They helped through depression days when 10 to 20 well qualified San Francisco engineers were available for every work opportunity and today when dozens of jobs are listed for every available engineer. They have helped to develop this important engineering employment aid in the West during a period of a changing and expanding economy, thus providing support to growing western industry, and help to incoming engineers and concerns. Throughout these extreme conditions, and in every circumstance between, the committee continually seeks to improve ESPS service to the community providing emphasis to the needs of employer or employee as required.

Newton D. Cook recently remarked, "Thirty years of service, same place, same problems, new faces, new conditions, but ESPS still serves; nothing wrong today that a few hundred new registrations wouldn't cure."

Pyramid Is Dwarfed

Statistic-minded U. S. engineers have discovered that one of their smaller projects is much larger than the biggest Egyptian pyramid, points out *Electrical World*. Lookout Point Dam on Willamette River and its regulating unit, Dexter Dam, contain three times as much material as the largest pyramid. Lookout Point is 630 feet high, while the pyramid is 482 feet.

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Stop-Watch on Way Out?

The use of the stop-watch method for time studies in industrial operations may be superseded gradually by elemental motion time systems, working sampling and other means of work measurement.

This opinion was expressed on Dec. 8 by Dr. Harold T. Amrine, chairman of Purdue University's industrial engineering department, at the opening session of a two-day Methods Improvements conference at the Illinois Institute of Technology.

Addressing some 200 leaders in government, business, labor, and education, Amrine predicted industry's increased use of operations research and other quantitative measures in the future will require more "team engineering."

"There will be increased need for methods engineers as well as other kinds of engineers," he said.

"These engineers should be better versed in the mathematical and physical sciences, in economics, and in the social sciences.

"However, the real problem is where they are all coming from. Our schools simply can't meet the demand."

He said the increasing population, which he placed at about 200,000,000 in 1970, will necessitate "greater and greater attention to automatizing operations and processes.

He noted that while the population is expected to increase approximately 35,000,000 or more than 20 per cent, during the next 15 years, the work force will increase by only 11 per cent.

This means, he added, that "more and more goods must be produced for more and more people with no tremendous increase in the work force."

Amrine urged that increasing attention be given to "the human element," and saw a future need for greater creativity on the part of methods engineers.

Dr. Joseph C. Moquin, director of the Armed Forces Management Engineering program, Rock Island Arsenal, told of recent methods improvements in the services.

Speaking at the luncheon meeting, Moquin said the government has a long history in scientific management, adding that it "can take credit for some of the pioneering efforts in this field."

He cited a pre-determined time system recently introduced by the Ordnance Management Engineering program at Rock Island.

Criteria of good methods in government, he stated, require that hand and body motion, equipment, process sequence, raw material and production design be balanced with economy, high quality, safety, speed of production, and other factors.

"In this period of progress in methods engineering," he explained, "we look upon this technique as a design, rather than primarily an improvement technique.

"It is true we will always find ways to better methods, but the first obligation of management is to design well initially, rather than correct the errors later."

The Dec. 8 program included technical sessions devoted to discussions of systems engineering, organization and operation of a methods engineering department, improvements in human engineering, commercial engineering research, quality control, and improved control sheets, charts and graphs.

The session of Dec. 9 was devoted principally to panel discussions. Luncheon speaker was Dr. Norman N. Barish, chairman of the industrial engineering department of New York university. His subject was: "Systems Analysis for Effective Administration."

Technical sessions covered new ways of standards engineering and labor, capital equipment and replace policy, operations research techniques, the impact of electronics on methods, linear programming, and methods improvement bonus and related incentives.

The conference was held in the Illinois Tech Commons building at 3200 S. Wabash avenue. Chairman was Dr. Henry Ludmer, associate professor of industrial engineering at IIT.

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Computer Is Still a New Tool

Applications of the electronic computer have just scratched the surface.

This was the concensus of engineers, scientists, and industrialists speaking at the second annual Computer Applications symposium Oct. 24-25 in Chicago.

The two-day meeting on computers for business and management and for engineering and research was sponsored by Armour Research Foundation of Illinois Institute of Technology.

"Computers of the present day will be considered by owners of computers 20 years from now in the same way as we think of Model T's," it was predicted by J. T. Horner, supervisor of engineering calculations, Allison division, General Motors corporation.

Speaking on "High Speed Computation of Engine Performance," Horner discussed the merits of computers for handling engineering problems, the problems handled at General Motors, and programming methods and procedures.

"Although we are using three different types of computers at the present time," Horner said, "we do not consider that our operations are as effective or economic as they will be made in the future."

He anticipated such improvements as development of symbolic internal computer codes, much larger and more compact high speed internal memory, and increases in speed in the computation of the future.

On the other hand, John L. Marley, head of the Chicago management consulting firm bearing his name, cautioned that companies should not jump into the field of electronics without a long, appraising look at the economic factors involved in converting to automatic computers.

Speaking on "A Dollars and Cents Approach to Electronics," Marley pointed out that financial activities must be directed toward bridging the gap between the receipt of raw accounting data and the preparation of accounting and control reports that are largely dictated by the individual needs of the business.

"Whether electronics provides a fast, direct, and economical method to 'bridge the gap' is the basic question at hand."

He suggested that before converting to electronics the company consider the type of computer to use and whether the field is moving too fast to appraise the situation in the proper light.

T. M. Bellan, supervisor of the department of applied mathematics at McDonnell Aircraft corporation, St. Louis, reported that the use of large scale high speed automatic computing devices of both analogue and digital types has become a standard operating procedure for the engineering divisions of aircraft manufacturers since the close of World War II.

"The increase in aircraft complexity, both in design and mission requirements, has burdened the engineers with a multitude of problems directly associated with the production item which, in the past, were only of academic interest to the researcher," he said.

"New frontiers have been opened as a result of advanced developments in propulsion systems," Bellan stated. "The 'unknown' has to be more thoroughly investigated. Detailed lengthy calculations are required on many of these explorations."

The introduction of automatic computing devices has enabled the aircraft industry to meet some of the added engineering load resulting from advancements in the "art," he added.

W. F. Otterstrom, controller, Montgomery Ward and company, indicated that Ward feels that is has just scratched the surface insofar as applications for electronics are concerned.

"There is much yet to be done in the accounting field," he pointed out, "but the real applications could easily be beyond the report field."

Otterstrom cited the following examples: more scientific placement of the 50,000,000 catalogs distributed each year, selection of the merchandise for make-up of merchandise lines, most profitable allocation of selling floor space, and sales and inventory forecasting.

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Civil Engineers Meet Feb. 13-17

The national winter convention of the American Society of Civil Engineers will be held in Dallas Feb. 13-17 in the Baker Hotel.

Attendance is expected to exceed 1,400, according to I. W. Santry, Jr., associate professor of civil engineering at Southern Methodist University, general chairman of the convention.

Some 80 technical papers will be presented. Meetings are scheduled for the Air Transport, Hydraulics, Structural, Waterways, Highway, Power, Sanitary Engineering, Surveying and Mapping, Soil Mechanics and Foundations, Irrigation and Drainage and Engineering Mechanics divisions. There will also be meetings of the Pipeline Committee of the Construction Division and the Department of Conditions of Practice.

Gov. Allan Shivers of Texas will address the convention at a general membership luncheon Feb. 15, at which ASCE President Enoch R. Needles of New York, will preside.

A symposium on the use of plastics as engineering materials will be one of the first comprehensive discussions on plastics to be held at an ASCE national meeting.

Four papers on plastics to be delivered will include:

"Plastics in Water Supply" by Walter Tiedeman, director of the National Sanitation Foundation laboratory at Ann Arbor, Mich.; "Plastics in Buildings" by Albert G. H. Dietz, professor of building engineering and construction, Massachusetts Institute of Technology; "Plastics—Engineering Materials" by C. Howard Adams, Monsanto Chemical Company, Plastics Division, Springfield, Mass.; "Classes of Plastic Materials" by Gordon M. Kline, chief of the Organic Materials Division, National Bureau of Standards.

Luncheons are scheduled for the Pipeline Committee, the Highway Division, the Soil Mechanics and Foundations Division and for students attending the convention.

A widespread representation for the Local Sections Conference will include delegates from Brazil, Panama, Puerto Rico, Venezuela, Mexico, Colorado, Kansas, Louisiana, Arkansas, Missouri, Tennessee, New Mexico, Oklahoma and Texas.

A panel program on professional development will be presented at a general session sponsored by the Department of Conditions of Practice. It will discuss the development of professional aims and attitudes in the legal and medical professions as well as the position of ASCE members in this respect.

A planned tour will include visits to pipeline installations and facilities in the Dallas area. There will also be informal tours of the Dallas-Fort Worth toll road route, the new Dallas Memorial Auditorium now under construction and the Turtle Creek Pressure Sewer project of the U. S. Corps of Engineers.

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Reviews of Technical Books

Electronic Circuits

Electronic Transformers and Circuits, by Reuben Lee, John Wiley & Sons, New York 16, N. Y. Second edition, 1955. 360 pages. Price, $7.50.

A basic work on the design of transformers for electronic apparatus, the book also furnishes information on the effects of transformer characteristics on electronic circuits.

The additions made by Lee were guided by the advances in the field made since the book's original publication in 1947. In the new chapter on magnetic amplifiers, the author covers the more common components and circuits and aims to introduce the subject to circuit and transformer designers alike. Another new chapter on pulse circuits contains material on line-type radar pulsers, false echoes after main pulse, charging reactors, and related details.

The other chapters cover: transformer construction, materials, and ratings; rectifier transformers and reactors; rectifier performance; amplifier transformers; amplifier circuits; higher-frequency transformers; electronic control transformers; and pulse and video transformers. Entirely new sections now appear on reactor surges, toroid curves, r-f power supplies, wide-band transformers, and charging chokers. Lee has also reworked his earlier discussions of transformer theory, core material, reactor theory and design, Class B transformers, audio filter inductors, rectifier regulation, leakage, and other points.

Lee has been affiliated with the Westinghouse Electric Corporation for over 30 years and is now advisory engineer there. He holds 24 patents on transformers and similar devices, and is the author of numerous papers that have been published in *Electronics, Tele-Tech, Electrical Manufacturing, Proceedings* of the I. R. E., and other journals.

High Vacuum Technique

High Vacuum Technique, by J. Yarwood, John Wiley & Sons, New York 16, N. Y. Third edition, 1955. 208 pages. Price, $5.50.

Revised to include the latest innovations in vacuum practice, the book covers theory, practice, and the industrial properties and applications of materials.

Information new in this edition includes data on the following: the gas ballast pump, large diffusion pumps and systems, new pump fluids, new materials, recent methods of using rubber gaskets, modern valve types, changes in low-pressure measurement techniques and in producing and measuring ultra-high vacua, and methods of leak-hunting using vacuum gauges. In the fresh analysis of vacuum pumps, Yarwood covers models that are currently available from both American and British manufacturers. The author also extends his discussion of the theory of the diffusion pump, particularly as this theory is of value to the user rather than the designer.

Chapter headings in the volume cover: the production and measurement of high vacua, the measurement of pumping speed, de-gassing and "gettering," the applications of high vacua in industry, and the properties of materials important in high vacuum technique.

Yarwood is head of the department of mathematics and physics at the London Polytechnic.

Agricultural Engineering

Principles of Farm Machinery, by Roy Bainer, R. A. Kepner, and E. L. Barger, John Wiley & Sons, New York 16, N. Y. 1955. 571 pages. price $8.75

The book is the latest addition to the Ferguson Foundation Agricultural Engineering Series.

Written from the engineering point of view, the new book stresses functional requirements and principles of operation for the basic types of farm machinery. Machines for a particular cultural practice, such as planting, are treated on the basis of the unit operations performed by the functional elements of the machine. While the common types of field machines receive major attention, the authors also include general discussions of materials, power transmission, economics, and hydraulic controls, each as applied to farm machinery. The book was submitted in preliminary form to the chief engineers of leading farm machinery companies so that the latest authoritative advice could be incorporated.

The individual chapters are concerned with research and development in farm machinery; field capacities and cost analysis; materials of construction; elements of rotary power-transmission systems; hydraulic controls and power-take-off drives; tillage force analysis and hitching; soil tillage: moldboard-type tools; disk tools; miscellaneous tillage equipment; earth-moving equipment; crop planting; row-crop cultivation, flaming, and thinning; application of fertilizers; hay harvesting: mowing, raking, and baling; forage chopping and handling; seed cleaning and sorting; grain and seed harvesting; corn picking and shelling; cotton harvesting; harvesting of root crops; spraying and dusting; and farm transport.

Bainer is chairman of the department of agricultural engineering at the University of California. Also at the University of California, Kepner is associate professor of agricultural engineering. Barger is education manager of the Ferguson Division, Massey-Harris-Ferguson, Inc.

Report Made for College-Agers

Three conditions must be met if private educational institutions are to accommodate the swelling college-age population, according to Dr. John T. Rettaliata, MWSE, president of Illinois Institute of Technology, Chicago.

The conditions listed in Rettaliata's 64-page annual report for the 1954-55 school year, are:

1. Private educational institutions must convince themselves they can acquire the means to expand their enrollments in order to accommodate the increasing number of students who will qualify for college admission.

2. Public institutions should consider raising tuition charges so that students with adequate finances will pay a more appropriate share of the cost of their education and thus appreciate it more.

3. The friends, neighbors, and benefactors of private educational institutions must rally to give financial assistance to the colleges and universities, thus eliminating the need for the institutions to increase charges to students.

Rettaliata warned that increased accommodations must be achieved without any sacrifice in the quality of the educational program.

It might be easier for private colleges to remain static, Rettaliata admitted. but if they do, they will not continue to be "a vital factor in their communities and contribute to the best traditions of private initiative."

The "tremendous need" for more college students capable of preparing for engineering and science careers was pointed out by Rettaliata, who said the reality of the shortage of technological and scientific personnel no longer is questioned.

The shortage, he added, has not been given sufficient attention because many felt the situation was temporary due to the decrease in birth rate during the depression years, and the Korean war.

"Such thoughts," Rettaliata declared, "are being dispelled as more persons are becoming aware that not only are too few future engineers and scientists being graduated, but that the demands for them are mushrooming as a result of our broadening technology."

One of the factors adversely affecting the development of more scientists and engineers, Rettaliata contended, is that some students make career decisions too late.

"The germination and cultivation of a future engineer or scientist should begin in the upper elementary grades and should not be delayed until he enters high school."

He said educators find that too many high school students who decide when approaching graduation that they would like to become engineers or scientists learn they have not taken prerequisite courses.

A Slick Idea

To prevent skidding, the New Jersey Highway Department is placing a "coarse sandpaper finish" on the roadway of heavily traveled Pulaski Skyway between Newark and Jersey City. The new surface consists of successive layers of hot tar, stone chips, hot tar again and finally a light topping of grits, says *Construction Methods and Equipment.*

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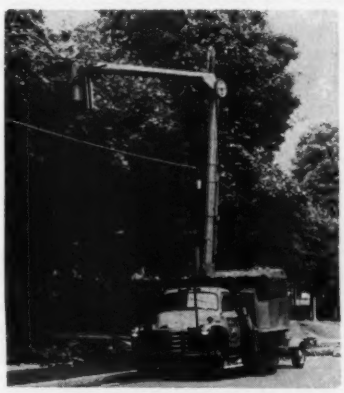

N. U. Civil Engineer Keynotes Conference

Dr. John A. Logan, chairman of the civil engineering department at the Northwestern Technological Institute, keynoted World Health Organization conference held Dec. 12-17 in Ibadan, Nigeria.

After the conference he conferred with officials of the University College of Khartoum, in the Sudan, on a proposed agreement between the college and Northwestern for the training of Khartoum staff members and graduate students and for a cooperative research program.

"Environmental Control in Tropical Africa" was the theme of the WHO conference, which brought together approximately 50 engineers, medical men, and scientists from the United Nations health group and the colonial dependencies and independent nations of tropical Africa.

Dr. R. M. Morris, secretary for health of the new Federation of East Africa, discussed Dr. Logan's paper on "The Principles of Environmental Control," the development and use of special techniques for dealing with special environments. These broad techniques have proved much more effective in raising living standards in underdeveloped countries than have attempts by individual experts to solve specific problems such as health, sanitation, transportation, or power.

Dr. Logan traveled to the Sudan under the auspices of the Northwestern program of African studies. It is anticipated that a cooperative agreement between the universities for research and training activities will receive support from the U. S. state department and the government of the Sudan.

Dr. Logan served with the U. S. Army during World War II as a member of the Amazon Valley project established to improve sanitation conditions in this region. He was on the staff of the Rockefeller foundation in Europe for eight years where he concentrated on problems of health and development. He made a number of visits to Africa under the auspices of the British Colonial Office while stationed with this group in London.

WSE Personals

Bernard A. Carroll, MWSE, 201 West Willow Street, Lombard, Ill., has been named superintendent of Technical Services at Automatic Electric Company, Chicago.

The company, which originated and developed the dial telephone, manufactures telephone equipment, and switches, relays and other components used in the automation of machines and processes.

A native of Asheville, N. C., Carroll came to Automatic Electric in 1934 from the Army Signal Corps Engineering Laboratories in Fort Monmouth, New Jersey. In addition to his membership in the Western Society of Engineers, he is a member of the Instrument Society of America and the American Quality Control Society.

* * *

J. Robert Ferguson, Jr. has been appointed an assistant vice president-engineering, United States Steel Corporation, it has been announced by John L. Young, vice-president. At the same time, it was announced that Patterson S. Weaver has been named to succeed Ferguson as chief engineer-project development for the corporation.

* * *

Ceco Steel Products Corporation announces that John F. Seifried, MWSE, Chicago district manager and member of the firm's Board of Directors, who was about to retire after more than 35 years of service, will remain in an advisory capacity with the company's Chicago District sales operation.

Seifried recently finished a term as president of the Chicago Engineers Club. Previously he served for two terms as president of the Illinois Section of the American Society of Civil Engineers. He also is a past president of the Chicago Technical Societies Council.

He was chairman of the committee that prepared the manual for detailing reinforced concrete buildings and bridges published by the American Concrete Institute.

Seifried has been identified with the changing skyline of Chicago during the past 35 years. He has been instrumental in the sale and engineering of the floor framing for such prominent skyline structures as the Merchandise Mart, the Tribune Tower, the Hotels Ambassador, Sheraton Hotel, 333 North Michigan Avenue Building, and the Conrad Hilton Hotel.

Other structures he has been associated with include Union Station, Buick Jet Engine Plant, Chicago Theater Building, Museum of Science and Industry, campus buildings for Northwestern and Chicago universities, main terminal building of O'Hare International Airport and many other large and small buildings throughout the Chicago area.

* * *

Einar T. Blix, MWSE president, Mississippi Valley Structural Steel Company, Chicago, has been elected to the Board of Directors of American Institute of Steel Construction, national trade association of the structural steel fabricating industry. He was elected at the Institute's 33rd Annual Convention.

Blix, who lives at 938 North Marion Street, Oak Park, has been in the fabricating business since 1920, and has for

Einar T. Blix

a number of years been active in affairs of the Institute.

Among his community interests are his service as director of Westlake Hospital, Melrose Park. He is also past trustee of the Oak Park Congregational Church.

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William H. Depperman has been appointed to the new position of director of public relations of Link-Belt Company, it has been announced by Robert C. Becherer, president. The position was established because of increased public relations activities due to the company's growth.

Depperman assumes duties which previously had been assigned to Harlan B. Collins, secretary, who will continue to have corporate responsibility for the function.

* * *

C. M. Basile, vice president of sales and manufacturing, Link-Belt Speeder Corporation, has announced the appointment of N. V. (Norb) Chehak as assistant sales manager. In his new duties at the factory in Cedar Rapids, Iowa, Chehak will aid the sales manager, G. W. Rowand.

Want a Life of Ease?

Would you live at ease, do what you ought, and not what you please.

—Poor Richard's Almanack

Electronic Brain Is Limited in Power, Industrialists Are Told

An "electronic brain" is only as clever as the human brain that operates it.

"The machine never will be able to give a result which could not also be reached by the human brain," Claus B. Ludwig told more than 200 businessmen, industrialists, and scientists Oct. 25 in Chicago.

Ludwig, project engineer at International Harvester company, Ft. Wayne, Ind., spoke at the Tuesday morning session of the second annual Computer Applications symposium at Armour Research Foundation of Illinois Institute of Technology.

"In the automatic computers, we are given new helping tools which eliminate the monotonous and time-consuming computations and which can be the essential bridge between the engineering concept and its numerical solutions," he stated.

Explaining the new tools, Ludwig said that the computers are controlled during the operations of data processing by wired control panels or by programs stored in the machine itself.

"The machine will not solve one equation with two unknowns, because the human brain could not do it either," he pointed out.

"But the machine will calculate in one second the path of an airplane for air defense purposes, while an individual would need several hours to arrive at an answer."

Both answers will be right, he added, but the human answer will be useless because of the time factor.

"Not only can the machine be no more clever than the human brain," Ludwig continued, "but the human brain must be more clever than the machine. The human must have a definite concept of the problem which the machine will solve."

A definite concept of procedure for every single problem is necessary before intelligent use can be made of large-scale computers, Ludwig stated. A theoretical investigation of the problem must be made because the machine could give too many values, hence, defeating its purpose.

To illustrate the actual machine time required by the different computers to solve one specific problem, he cited a calculation which involved 3,000 additions and subtractions, 4,000 multiplications, 800 divisions, and 1,000 logical decisions. All operations were executed with seven digits.

The different machine times required to execute these operations were: Desk Calculator, 100 hours; IBM 604, 12 hours; CPC, 4 hours, and the IBM 702, 20 seconds.

"It appears that the time element decreased tremendously as we used more competent machines," he pointed out. "This improvement is due not only to the higher internal speed but also to the ability of the larger machines to make logical decisions."

He added that the increased complexity of engineering problems requires new, powerful labor-saving devices in order to reduce the routine efforts of highly skilled technical personnel and in order to make possible the solution of many problems not efficiently soluble at the present time.

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WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

41-55 Joseph L. Zagotta, Jr. Design Engineer, Acme Steel Company, Riverdale, Ill.

42-55 Thomas K. Breitfuss, Assist. to Managing Director, American Concrete Pipe Association, 228 N. LaSalle St.

43-55 Robert J. Simonson, Distribution Engr. E-2, Commonwealth Edison Company, 72 W. Adams St.

44-55 Jordan M. Cole, Assistant Engr., The Industrial Erectors, Inc., 1316 W. Cermak Rd.

45-55 William J. Buchanan, Engineer-Manager, South Cook County Mosquito Abatement District, PO Box 338, Posen, Ill.

46-55 Richard B. Schopp, Engineer III, Commonwealth Edison Company, 72 W. Adams St.

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Chicago Area Career Conference Set for March 24

Career opportunities in some 100 fields will be considered at the eighth annual Chicago Area Career conference on Saturday, March 24.

The conference, to be held on the Illinois Institute of Technology campus, is sponsored each year by the Chicago Technical Societies Council, Chicago Sun-Times, and Illinois Tech.

The conference is designed to assist high school students in obtaining information helpful in preparing for careers, according to general chairman Frank J. Hopp, research chemist for Universal Oil Products company.

The conference will include 32 panels, composed of professionals in the fields being discussed.

"In this way," Hopp pointed out, "each student can be provided authoritative information concerning a number of occupations, particularly from the standpoint of personal and educational requirements, advantages and disadvantages, rewards and responsibilities, and trends and opportunities."

One of the features of the conference, introduced two years ago, will be an Illinois Tech-sponsored high school newspaper editor's luncheon on Feb. 11.

At the luncheon, the Sun-Times will announce a contest for the best high school paper editorial about the conference. A prize will be awarded the school publication in which it appears.

The conference is expected to attract considerably in excess of the approximately 1,300 boys and girls who attended the 1955 sessions, according to Clarence E. Deakins, Illinois Tech dean of students, who is coordinating arrangements at the Institute.

The attendance last March represented 135 public, private, and parochial schools in Chicago and the suburbs, and 15 junior colleges, colleges, and universities.

Dr. Lester G. Massey, process engineer at Universal Oil Products, is chairman of the speakers' committee, and Kenneth R. Brown, laboratory director at Sherwin-Williams company, heads the liaison committee to work with the school vocational guidance counselors.

New Calif. College To Be Established

A new college of liberal arts emphasizing basic science and engineering, and bearing the name of the late Harvey Seeley Mudd, Los Angeles mining engineer and civic leader, will be established at Claremont, Calif., William W. Clary, Los Angeles attorney and chairman of the Board of Fellows of Claremont College, has announced.

The new college is being established as a member of the Associated Colleges in response to the anticipated doubling of the college population in Southern California in the next 12 years and the acute need for scientists and engineers in American industry, Clary said.

For three decades prior to his death last April, Mudd was active in the development of the group plan of colleges at Claremont, having served as chairman of the board of Claremont College, central coordinating institution, for 18 years and as a trustee for 29 years. Mudd's father was the board's first chairman.

Mrs. Harvey Mudd is a trustee of Claremont College, as is their son, Henry T. Mudd, who also serves on the board of Claremont Men's College.

Harvey Mudd is remembered in Southern California for his activities in many fields. He was the principal founder of the Southern California Symphony Association, was a director of the Hospital of the Good Samaritan, a member of the Advisory Board of the Huntington Library, head of the Los Angeles War Chest in 1943 and campaign manager of the Community Chest in 1947.

As a mining engineer, he received many awards and was president of the American Institute of Mining and Metallurgical Engineers. In 1948 he was awarded the Egleston medal of Columbia University, one of the highest awards granted in the engineering field.

Under the Claremont Plan, the new college will share in the use of the central buildings and facilities of the Associated Colleges, including Honnold Library, Bridges Auditorium, the science building and the medical buildings and services. The present colleges are Pomona College, Scripps College, Claremont Men's College, and Claremont College.

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Contract Is Let For Reactor Fuel

The first lump-sum contract to build reactor fuel elements in a privately owned facility has been awarded to The Babcock & Wilcox Company according to an announcement made Dec. 14 in Washington, D. C. by the Atomic Energy Commission. The announcement said that the contract was let on competitive bids and calls for at least 325 fuel element assemblies to replenish the core of the Materials Testing Reactor at Arco, Idaho, operated by the Phillips Petroleum Company for the A.E.C.

A prototype fuel element of the kind to be built under the contract, has already been manufactured and was placed on display Dec. 14 in the Babcock & Wilcox exhibit at the International Atomic Exposition being held at the Cleveland Auditorium in Cleveland, Ohio. The unit was built at the company's temporary plant facilities at Lynchburg, Va. The new fuel element fabrication plant now under construction at Lynchburg is expected to begin full-scale operations this spring and will be the first major facility of this type in private industry. Delivery of the first 35 MTR assemblies to Arco is scheduled for August 1956.

Total amount of the contract is approximately $90,000. In making the announcement, Lewis L. Strauss, chairman of the A.E.C., emphasized that the award of the contract was significant in the development of a civilian atomic energy industry and of the related specialized skills. In addition, purchase of the fuel assemblies from a commercial supplier will make the facilities of the Oak Ridge National Laboratory, previously used for this purpose, available for other work, he said. A total of 47 firms were invited to submit proposals and Babcock & Wilcox was selected from among the 12 received, he revealed.

B & W also has on display at Cleveland models of the fuel elements which will be used in the reactor in the 236,000 kw atomic-electric power plant Consolidated Edison will build near Indian Point, N.Y. Babcock & Wilcox has a contract to design and build the nuclear portion of this plant which will supply electric power to the New York City area. This is the first such plant to be conceived and financed solely on a private enterprise basis and is also the largest yet proposed.

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Printed Circuits In Full Production

Complete facilities ranging from design through the manufacture of printed circuits have been announced by Cleveland Metal Specialties Company, 1783 East 21st Street, Cleveland, Ohio.

"Printed circuits are the result of the evolution within the electrical and electronics field," Roger Middlekauff, the company president, said. "We have been working with printed circuits for some time, and realizing its vast application to the entire electrical field, have geared our organization so that we can produce printed circuits from its basic design through the final stages of the finished product."

The Cleveland company has produced printed circuits for electronic instruments, appliances, ordnance and automotive uses.

A two-phased approach to the printed circuits is used by the company. In many instances, they have taken an already existing product made with conventional wiring and have redesigned the circuiting so that a printed circuit would be applicable. The second approach is that of a new product or a new model of an already established product and design a circuit for it.

Cleveland Metal Specialties is producing the circuits in multiples and is using the photo etching of copper laminate process with the circuits shipped ready for dip-soldering and assembly.

An additional feature of the company's service in the field is an exclusive tin-plating process. It increases the eutectic qualities of the copper conductors and provides long term corrosion resistance in addition to providing easier soldering.

On Strength

Who is strong? He that can conquer his bad habits.

—Poor Richard's Almanack

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Interior view of Underground Garage

If you're not driving it's still convenient to get to and from WSE meetings.

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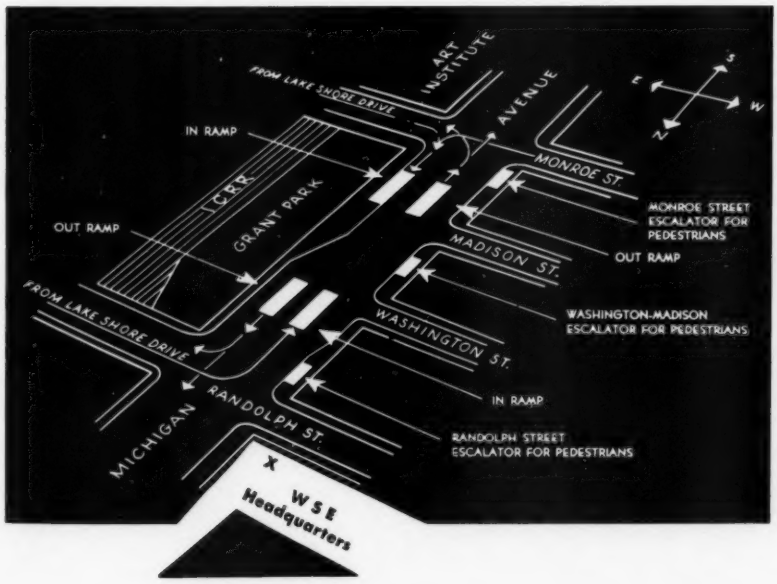
- The Cab Stand is just across the street
- The Elevated is one block west
- The Subway is two blocks west
- Buses stop at the door or within a few blocks for every part of town
- The IC Suburban station is across the street
- Other suburban stations are conveniently served by bus or elevated.

You see, your WSE Headquarters is at the handiest place in Chicago.

Below: map showing Park Department Underground Garage



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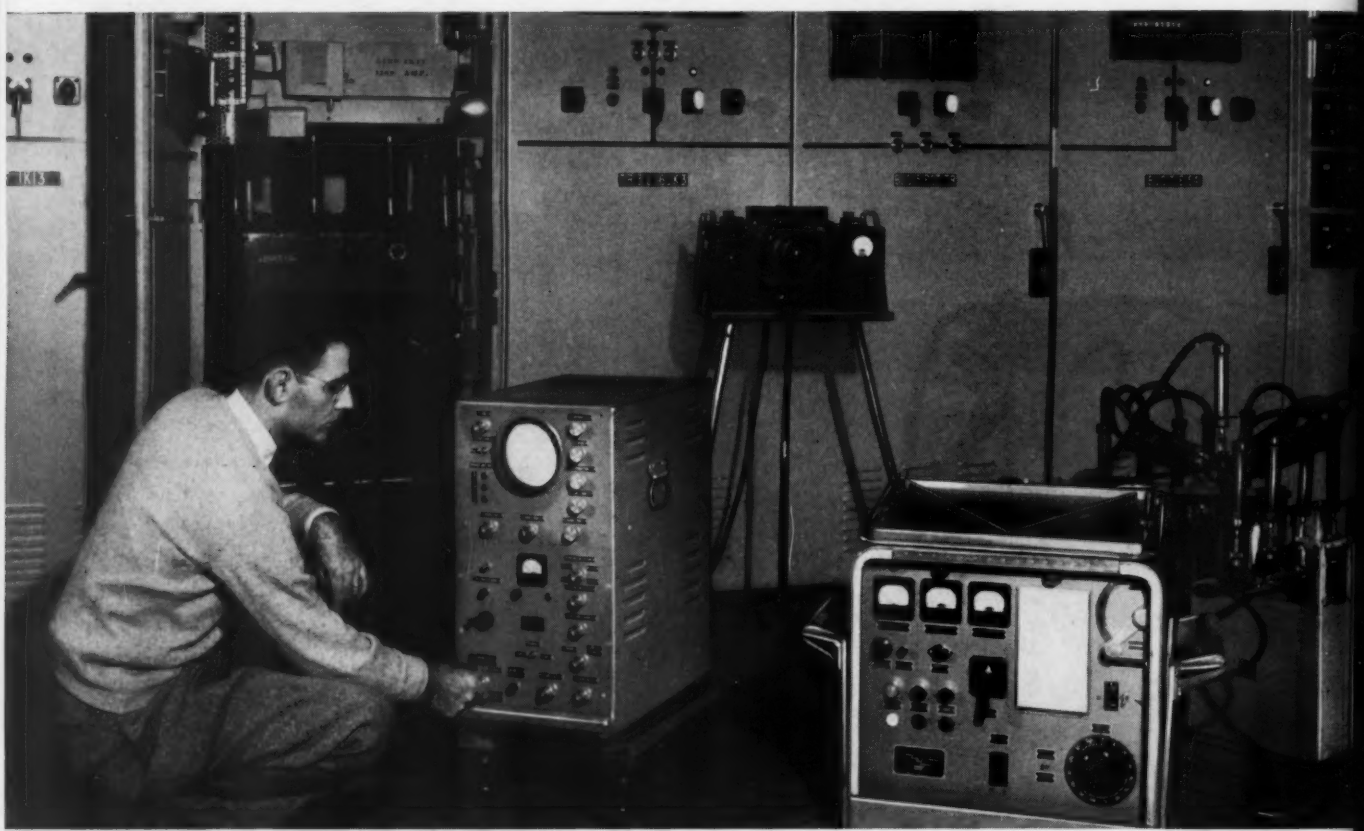

Commonwealth Edison engineers, like Al Zanona use this fault-locating equipment to pinpoint the location of cable faults. This information greatly aids the rapid repairs of cable failures which insure good service to our customers.

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No one method of locating faults is perfect—each has its own application. But Edison engineers, by constantly inventing, improving, and modifying fault-location equipment to meet local needs, have made many important forward steps.

Many years ago, they developed one of the first fault locators, the Murray Loop. Based on the Wheatstone Bridge principle, it can employ very high voltages to find high-resistance faults. This "old-timer" has stood the test of time and is still in everyday use.

In another case, an impulse-type locator used successfully by other utilities proved surprisingly ineffective on our own system. Through extensive research, Edison engineers found the reasons (one of which was the fresh water in the Chicago area) and then redesigned the equipment. Now this is one of our most useful fault-locating devices.

Recently, our engineers developed an exciting new idea—a radar fault locator. It has already proved unequalled in its ability to locate open conductors in remarkably short time. This radar locator is still being improved, and appears to have even greater future possibilities.

This outstanding work in fault locating is typical of the way Commonwealth Edison engineers tackle challenging problems and come up with new and better ways of doing the job.

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